

## ABSTRACT

A method of fabricating a gallium nitride-based semiconductor structure on a substrate includes the steps of forming a mask having at least one opening therein directly on the substrate, growing a buffer layer through the opening, and growing a layer of gallium nitride upwardly from the buffer layer and laterally across the mask. During growth of the gallium nitride from the mask, the vertical and horizontal growth rates of the gallium nitride layer are maintained at rates sufficient to prevent polycrystalline material nucleating on said mask from interrupting the lateral growth of the gallium nitride layer.

In an alternative embodiment, the method includes forming at least one raised portion defining adjacent trenches in the substrate and forming a mask on the substrate, the mask having at least one opening over the upper surface of the raised portion. A buffer layer may be grown from the upper surface of the raised portion. The gallium nitride layer is then grown laterally by pendeoepitaxy over the trenches.